

Thermal Management System for Long-Lived Venus Landers, Phase I



Completed Technology Project (2010 - 2010)

Project Introduction

Long-lived Venus landers require power and cooling. Heat from the roughly 64 General Purpose Heat Source (GPHS) modules must be delivered to the convertor with minimal ΔT . The cooling system must be shutoff during the transit to Venus without overheating the GPHS modules. This program will develop an alkali metal Variable Conductance Heat Pipe (VCHP) integrated with a two-phase heat collection/transport package (HTP) between the GPHS stack and the convertor. The VCHP allows the Stirling converter to be shutoff during transit to Venus. The two-phase HTP minimizes the temperature drop between the multi-GPHS stack and the heater head. The HTP is required due to the large number of modules that must be interfaced, and the low allowable ΔT between the heater head temperature of 1200

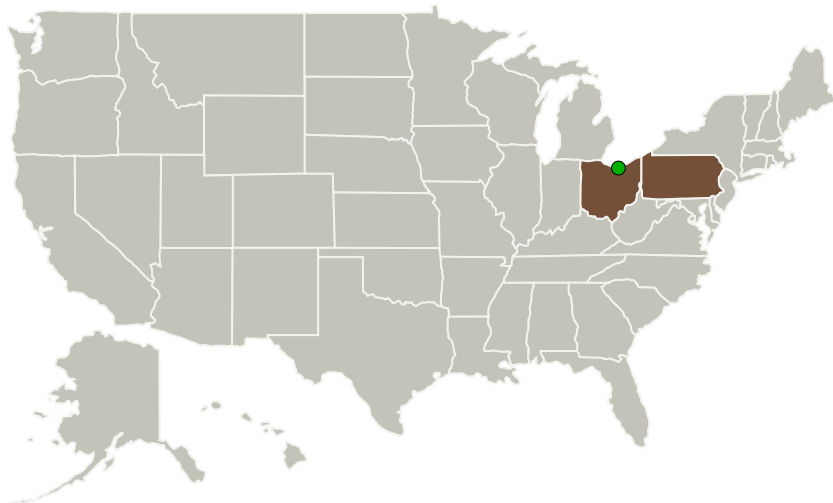
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C and the maximum allowable iridium cladding temperature in the GPHS (1266

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C). The HTP also improves the convertor efficiency by decreasing the temperature non-uniformities at the high heat flux interface of the hot end of the heater head. It is superior to pumped liquid systems for transferring heat, because it eliminates the low efficiency liquid metal pump that they require. Other advantages of the system include low mass and volume, and a high degree of redundancy.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Advanced Cooling Technologies, Inc.	Lead Organization	Industry	Lancaster, Pennsylvania
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Pennsylvania

Project Transitions

 **January 2010:** Project Start

 **July 2010:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137410>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Cooling Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Calin Tarau

Co-Investigator:

Calin Tarau

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Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System